

# Environment, Safety, and Health in the Extreme



The McMurdo Research Station is located at the southern tip of Antarctica's Ross Island on the shore of McMurdo Sound, about 3,500 kilometers south of New Zealand. To reach this isolated place, personnel must take an hours-long flight onboard a C-130 aircraft from New Zealand. (Courtesy of the National Science Foundation; photographer Elaine Hood.)

**A**NTARCTICA is not a place for the faint of heart. The below-freezing temperatures, unpredictable weather, and desolate landscape make it one of the most extreme environments in the world. Except for the few brave souls who visit Antarctica to work at research stations and conduct scientific investigations, the continent remains a virtual island of solitude. The director of Livermore's Environment, Safety, Health, and Quality (ESH&Q) Directorate, Allen Macenski, is one of those brave souls.

During his two-and-a-half years on and off "the ice" in the 1990s, Macenski managed environment, safety, and health (ES&H) activities that supported the McMurdo Research Station, an American facility located on Antarctica and operated by the National Science Foundation. He oversaw contracts for science and engineering operations, managed training and worker assurance programs, and implemented plans for waste cleanup and removal. For Macenski and his team, effective execution

of industrial hygiene requirements, waste management, and environmental stewardship was paramount to the safety and success of scientific expeditions and to minimizing humanity's footprint in one of the most pristine and scientifically valuable places on Earth.

Today, Macenski applies these same concepts at Livermore. Drawing on his experience, Macenski leads the ESH&Q Directorate in developing solutions and maintaining standards that enable the Laboratory to conduct safe and environmentally compliant operations in support of its missions.

## A Delicate Balance

Safe operations begin with verifying that personnel are qualified and able to perform the planned work activities. While in Antarctica, Macenski was responsible for ensuring that personnel were screened and trained to live and work in an extreme



## Expecting the Unexpected

One of Allen Macenski's most memorable moments on the ice occurred when he and four other people were sent to remove asbestos from a biology station near a penguin rookery. What was supposed to be a one-day project turned into a 72-hour ordeal.

The plan was to get dropped off in the morning, work until about 1:00 p.m., and then return to the station via air transportation. But the afternoon came and went, and no one arrived to pick them up. Macenski says, "The temperature began to drop, and the wind started to pick up. We looked up at the summit, and saw the snow being blown off the top ridge. We knew there was a storm coming." The winds reached approximately 170 kilometers per hour and visibility was less than 1 meter.

Team members had to anchor themselves to one another and then to the building. The building was located on a peninsula, a few hundred feet from a 240-meter cliff. Macenski says, "If the building had become detached, we would have gone over." Three days later, when the weather cleared, they were rescued. Antarctica's unpredictable weather is just one reason why survival training is so important for living and working safely in the extreme.



Inside the "cozy" biology station near the penguin rookery, Allen Macenski finds shelter from an unexpected storm.

environment. On the ice, individuals must live for extended periods of time in confined spaces, almost completely isolated from the outside world. As a result, all personnel undergo extensive medical evaluations for physical and psychological conditions that could become dangerous or deadly. "The phrase 'cabin fever' is colorful terminology, but it doesn't accurately describe the seriousness of the condition," says Macenski. Additionally, all personnel must complete a survival-training program when they arrive. Proper training helps reduce the risk of accidents and prepares people for life-threatening situations. (See the box at left.)

Worker assurance programs and training are just as essential at the Laboratory as they are in Antarctica. For example, training is needed for using specialized equipment, working with hazardous materials, or conducting experiments. Also, personnel must be trained and qualified for maintenance operations that include electrical-, hydro-, or gas-powered mechanisms or that require entering a confined space. Whether at the Laboratory or in Antarctica, personnel must be both physically able and competent to perform the work.

Another step in conducting safe operations is to evaluate the processes that will be used for completing the work. "In Antarctica, the main mission is science, specifically scientific exploration of the environment," says Macenski. "Performing risk assessments of the proposed work was a large part of my job." He would review research proposals, help plan work activities, evaluate whether those activities fit within the confines of the project, and develop work controls. These processes helped evaluate the efficacy of the work tasks, protect the participants, and predict and minimize any negative effects of research on the environment.







During his time in Antarctica, Allen Macenski managed the cleanup of a 5-acre legacy waste dump at McMurdo Research Station. (Inset) The waste was excavated, segregated, containerized, and shipped off the continent, revealing a more pristine landscape.



Achieving this delicate balance between safety, scientific necessity, and environmental viability is also important at the Laboratory. Using an integrated safety management (ISM) approach, Livermore organizations define the work, analyze the hazards, develop controls, and perform the work. The final step is to gather feedback and improve processes. The ISM approach encompasses all the people and processes needed to conduct work safely and in accordance with environmental regulations.

### Cleaning Up a Legacy

Pollution prevention and waste management are necessary components of safe operations to protect the environment. According to Macenski, before a proposed research project begins, every part of the project must be evaluated. These evaluations help define environmental aspects such as the disposal of potential by-products and waste, including leftover supplies and equipment. Macenski has seen firsthand what happens when this step is left out of the process.

During his time at the McMurdo Research Station, he oversaw the cleanup of a waste dump that had existed for decades. “We found items dating back to the 1930s,” says Macenski. “We had to develop an environmental stewardship program to reexcavate the waste, segregate it, containerize it, and then ship it off the continent.” He and his team also had to develop an environmental project plan on how to dispose of waste in the future to prevent the situation from recurring.

The Laboratory also understands the importance of cleaning up legacy issues and reducing its environmental footprint. Prior to the Laboratory being established in 1952, the land it now occupies was the site of a U.S. naval air station. At that time, products used to clean jets at the base contained chemicals that eventually seeped

into the ground and contaminated the groundwater. Through effective groundwater contamination treatment procedures, the Laboratory provided remedial solutions to the problem. Groundwater monitoring continues to be an important aspect of safe operations at the Laboratory.

### Two Places, One Goal

Living and working in the extreme environment of Antarctica presents challenges that require resourcefulness and flexibility. Surviving the below-freezing temperatures and erratic weather patterns is part of everyday life. The experiences Macenski gained during his time on the ice serve him well in his role at the Laboratory. “I can find a path to success based on the challenges I faced in that environment,” says Macenski.

“In Antarctica and at the Laboratory, the people are driven and hard working, they want to succeed, and they want to go home as healthy as when they arrived,” he says. Through effective application of ES&H policies and procedures, Macenski and the ESH&Q team help ensure safe operations that protect employees and the surrounding community and reduce the Laboratory’s environmental footprint on the future.

—Caryn Meissner

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